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Osseointegrated Oral Implants in Head and Neck Cancer Patients

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After cancer treatment in the head and neck area, mastication and speech are often affected. Some of the problems encountered can be solved by adequate dental rehabilitation. However, dental rehabilitation is often compromised for various reasons. The change in anatomy due to surgery often results in lack of denture-bearing mucosa. The effects of radiotherapy on the salivary glands and the mucosa result in dry oral tissue and diminished retention of removable dentures. Osseointegrated oral implants can help to solve these problems. Although implant treatment for patients with cancer of the head and neck is covered by the Dutch national health insurance, and there is therefore no financial obstacle, implants have not, so far, been widely used with these patients. In order to establish the possible reasons for this, an analysis was performed. Retrospective data on 95 consecutive patients were collected from records. The indication for the use of oral osseointegrated implants was reviewed. Analysis of the data showed that 45% did not need specific prosthetic rehabilitation. An indication for the use of osseointegrated implants was found in 25% of the patients. For various reasons, only 3% actually received implants. In striving to completely rehabilitate a cancer patient, the possible use of osseointegrated oral implants should be evaluated before the initial oncological treatment begins. The insertion of implants during the initial surgical procedure should be considered more often, with a view to reducing the number of surgical procedures.

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INTRODUCTION

Osseointegrated oral implants are widely used and accepted for prosthetic treatment of edentulous and partial edentulous patients. A good restoration of esthetics and function is possible when using fixed bridges or overdentures, and the long-term results are good.¹⁻³ The application of osseointegrated oral implants after treatment of malignancies of the head and neck would, therefore, also appear to be plausible.

For various reasons, the prosthetic rehabilitation of these patients is compromised. In dentate patients, loss of teeth occurs because of the ablative surgery and/or due to radiotherapy. In both dentate and edentulous patients, the prosthetic management is complicated by the changes in anatomy due to surgery. When a pedicled musculocutaneous graft or a free vascularized graft is used for surgical reconstruction, denture function will be impaired due to the frequent excess of soft tissue and lack of denture-bearing mucosa. The effects of irradiation on the mucosa, salivary glands, and saliva itself have an additional negative influence on the function of the dentures.

In the literature, case reports have been published on the successful oral rehabilitation with osseointegrated oral implants.⁴⁻⁷

Esser and Montag⁸ published a study relating to a group of 23 patients treated with osseointegrated oral implants after tumor treatment of the lower third of the face. Some of the patients had had radiotherapy. The maximum follow-up of this group of patients was 30 months. The implantation procedure was carried out 1 year after the irradiation. Two patients lost their implants due to lack of osseointegration. One patient lost his implants because of treatment of a local recurrence. Riediger⁹ reported the implantation in a free vascularized

crista iliaca graft in nine patients. All implants were functional after a maximum follow-up of 30 months. Albrektsson et al.³ reported on 31 implants in irradiated mandibles and maxillae. No implants were lost after a follow-up of 1 to 5 years. Taylor and Worthington¹⁰ published their results relating to four patients treated with oral implants after radiotherapy and surgical treatment of a tumor in the head and neck. Three patients were treated with hyperbaric oxygen prior to implantation. The follow-up for the implants was 2 to 7 years. None of the implants were lost. Neukam et al.¹¹ inserted 110 oral implants in 21 tumor patients and 26 extraoral implants in nine patients. Twelve implants placed intraorally were lost.

Urken et al.¹² reported on a group of 10 patients reconstructed with an iliac crest free flap and osseointegrated implants, of which four had received radiotherapy. Evaluation showed that these patients had a stable and retentive prosthesis and a better chewing ability than a nonreconstructed group.

It would therefore appear that osseointegrated oral implants can be successfully used in these patients. No serious adverse effects when osseointegration failed, such as osteoradionecrosis or loss of a bone graft, have been published.

We have noticed, however, that although the treatment is feasible, successful, and available to all patients, only a few patients are actually treated with oral implants in our clinic. An analysis was performed to review the indications for implant placement and the specific reasons why only a few patients were treated with implants.

MATERIALS AND METHODS

A review was carried out, using patient records, of all the patients who presented themselves between January 1989 and December 1990 to the Department of Oral and Maxillofacial Surgery at the University Hospital Nijmegen with tumors of the head and neck. The following data were obtained: tumor diagnosis and TNM classification,¹³ location of the tumor, dental status before treatment, the specific treatment of the tumor, and the prosthetic rehabilitation. The indications for placement of oral implants were retrospectively reviewed. During the 2 years, 95 patients presented themselves (33 women and 62 men); their ages varied from 30 to 91, with a mean of 62 years.

| TABLE I. Location of the Tumor (n = 95). | |
|---|--------|
| Location | Number |
| Tongue | 25 |
| Floor of the mouth | 31 |
| Retromolar pad, pharynx | 12 |
| Maxilla | 12 |
| Remainder | 15 |

| TABLE II. Treatment of the Tumor (n = 95). | |
|---|--------|
| Mode of therapy | Number |
| Surgery | 35 |
| Surgery followed by radiotherapy | 44 |
| Radiotherapy followed by surgery | 2 |
| Radiotherapy and/or chemotherapy | 14 |

RESULTS

Diagnosis

Of the 95 patients, six were diagnosed as having a metastasis from another site.

Of the remaining patients, 59 were classified as having a T₁ or T₂ tumor and 30 as having a T₃ or T₄. By far the most tumors were squamous cell carcinoma. The tumors were most frequently localized in the tongue and the floor of the mouth (Table I).

Tumor Treatment

Eighty-one patients were treated surgically with a local resection (Table II), and in 61 cases this was combined with a neck dissection. Forty-six also received radiotherapy, with an irradiation dose ranging from 64 to 70 Gy.

Fourteen patients were treated by radiotherapy and/or chemotherapy only.

In Table III, the type of surgery is specified. In most of the patients, only soft tissues were resected (58). In 23 patients, a resection of bone had to be performed as well.

In all the patients who underwent a resection of the mandible with loss of continuity (n = 7), the defect was closed with a pectoralis major musculo-cutaneous flap. In six patients, this was combined with an AO reconstruction plate.

Dental Status

Before treatment, 67 patients were completely edentulous. The remaining 28 patients were at least partially dentate. The resections compared to the

| TABLE III. Type of Surgery (n = 81). | |
|---|--------|
| Surgical Treatment | Number |
| Partial resection of the maxilla | 8 |
| Partial resection of the mandible with loss of continuity | 7 |
| Partial resection of the lingual cortex of the mandible | 6 |
| Partial resection of the mandibular alveolar process | 2 |
| Soft tissue resection only | 58 |



Fig. 1. Intraoral view of patient with soft tissue reconstruction insufficient for dental rehabilitation without correction of soft tissue and insertion of dental implants.

dental status are shown in Table IV. As a consequence of the treatment, teeth were extracted in 14 patients. Seven patients lost teeth at the site of the resection of the tumor, and seven others lost teeth because the teeth were seen as a complicating factor in relation to radiotherapy.

As a result of these extractions, six patients became edentulous.

Prosthetic Treatment

Of the 28 patients with their own (partial) dentition, 12 did not need any special prosthetic treatment postoperatively. Eleven of them had an adequately functioning partial denture, sometimes requiring minor adjustments. One patient died shortly after surgery. Four patients had no removable dentures at the time of the evaluation, although there was a strong indication for prosthetic treatment (two patients had become completely

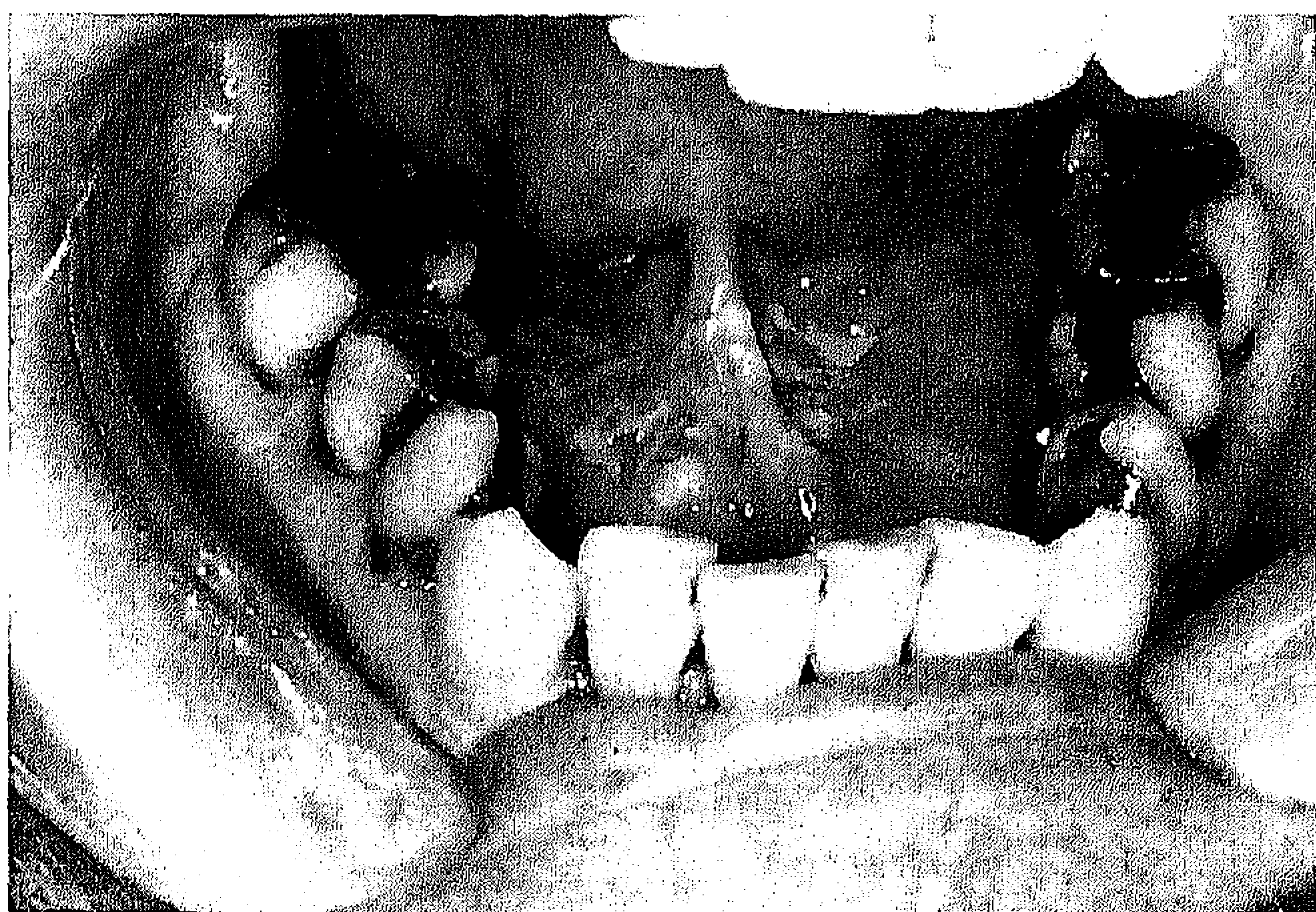


Fig. 2. Preoperative view of localization of leukoplakia and squamous cell carcinoma in floor of the mouth.

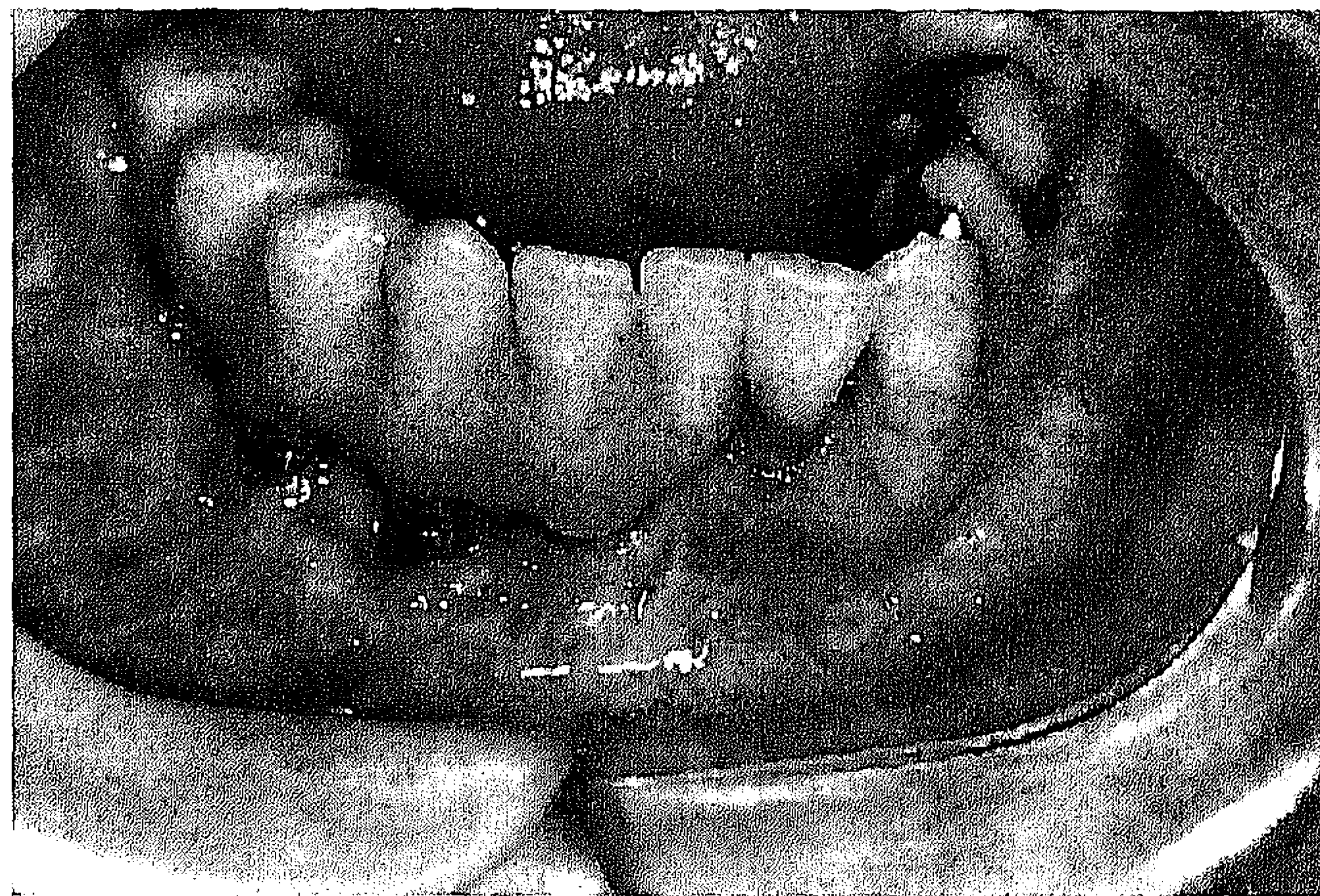


Fig. 3. Intraoral situation after resection of tumor including part of the inferior alveolar process with loss of teeth and reconstruction with osseointegrated oral implants and fixed bridge.

edentulous). However, three of them refused dentures, and the fourth patient had a poor prognosis.

Of the 67 edentulous patients, 21 received new dentures that functioned well. Eight patients refused dentures. Twenty-six patients died before the time of the evaluation. The 12 remaining patients either have no dentures or dentures which function poorly, and could probably benefit from oral implants. Five of these patients have had a bone resection of some sort. Of these 12 remaining patients, four refused implantation. One patient has developed an osteoradionecrosis of the mandible, which is a contraindication for inserting implants. One patient recently had a local recurrence. Two patients developed Alzheimer's disease. Another patient had a mandibular height of 5 mm, too low for insertion of implants. At a later stage, an alveolar ridge augmentation combined with implants might be appropriate. Therefore, only three patients were finally treated with implants, a total of 3% of the entire group (Table V).

DISCUSSION AND CONCLUSIONS

The patient is seen by the prosthodontist after the wound has healed or postoperative radiotherapy has been completed. Twelve patients did not need any prosthetic treatment. Thirty-two patients were treated by making conventional removable den-

TABLE IV.
Dental Status and Surgical Treatment.

| Surgical Treatment | Dentate (n = 24) | Edentulous (n = 57) | Total (n = 81) |
|---------------------------|---------------------|------------------------|-------------------|
| Resection of the maxilla | 4 | 4 | 8 |
| Resection of the mandible | 5 | 10 | 15 |
| Soft tissue only | 15 | 43 | 58 |

Table V.
Results (n = 95).

| | |
|--|----|
| No prosthetic treatment necessary | 12 |
| Adequate conventional prosthetic treatment | 32 |
| Deceased or bad prognosis | 28 |
| Refused prosthetic treatment and/or implants | 15 |
| Local or general contraindications | 5 |
| Implant treatment | 3 |

tures. Therefore, 45% did not need specific prosthetic treatment.

Oral implants are considered if complete dentures are considered inopportune or dentures do not function well. At this stage, 15 patients refused further treatment. The adverse reactions of these 15 patients to prosthetic treatment and implants were partly due to the fact that patients did not want to undergo further treatment, surgical or prosthetic, which was not essential for their survival at that time. Some patients stated that they had never had good dentures and therefore had no need for them now. Another reason for the low number of patients treated with implants could be that, during the initial discussion about their tumor treatment, no mention was made of possible reconstruction with oral implants. Moreover, the patient was sometimes told that he/she might in fact never again have dentures that functioned well. The patients' expectations therefore remained low. Because implant treatment and prosthetic treatment in these patients is covered by national health insurance, the explanation for this situation cannot be financial.

Although 24 patients (25%) could theoretically benefit from oral implants when we looked at their oral and dental conditions, six (7%) had to be excluded due to local and general contraindications. Fifteen (15%) refused treatment, but might still be candidates at a later stage. Just three (3%) of our series actually received implants. Taking into consideration all the factors, we do not expect there to be a significant increase in the demand for implants as a second procedure. When striving to rehabilitate the

cancer patient at a high prosthetic standard, the indication for oral implants must be considered before the initial treatment of the malignancy. The insertion of oral implants, in combination with the initial surgical procedure, should probably be considered more often.

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